SAC3937AQP4

GaAs MMIC Driver Amplifier
0.03GHz~3GHz 30dBm

Rev 1.0

Features

- Frequency:0.03~3GHz
- SS Gain:16dB
- OP$_{-1}$dB:30dBm typ. ,29dBm min.
- Power supply: +12V
- Package:4mm×4mm×0.75(Typ.) mm
- Bare die:1.25 mm x1.55 mm x0.1mm

Typical Applications

- IF Amplifier
- Driver Amplifier

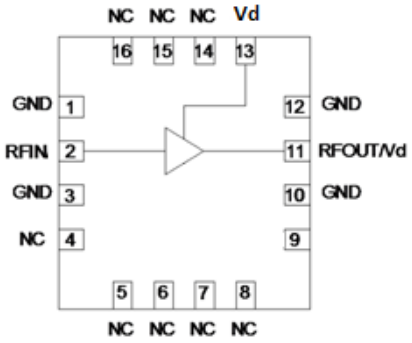
General Description

SAC3937AQP4 is a GaAs MMIC self-biased Driver Amplifier in QFN surface mount package, which operates between in 0.1~3GHz.

SAC3937AQP4 can provide 16dB of gain, 30dBm of output P$_{-1}$dB while requiring 360mA from a single +12V supply voltage.

SAC3937AQP4 is assembled in a 4mm x 4mm RoHS-compliant low stress injection molded plastic QFN package.

Functional Diagram



Electrical Performance

T_A=25℃, V_D=+12V, I_{DQ}=0.36A, Z_0=50Ω, CW

Parameter		Min.	Typ.	Max.	Units
Frequency Range		0.03	—	3	GHz
Small Signal Gain		14	16	—	dB
Gain Flatness		—	±0.5	±1	dB
Reverse Isolation		—	-24	—	dB
RF Input VSWR		—	1.5	2.5	:1
Output P$_{-1}$dB	f=0.1GHz	—	29	—	dBm
	f=1.5GHz	—	30	—	
	f=3GHz	—	29	—	
Supply Current (ID)		—	—	0.45	A
Thermal Resistance			16.9		℃/W

Absolute Maximum Ratings

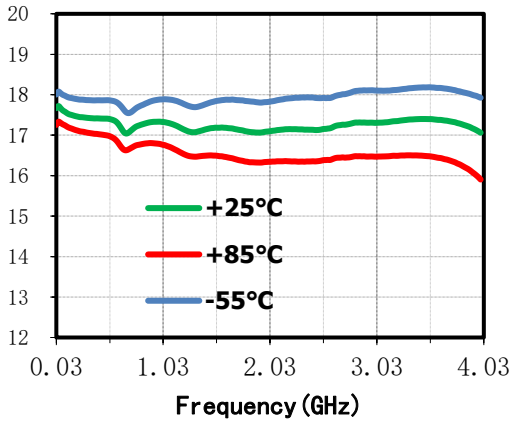
Maximum Input Power	+20dBm	Operating Temperature	-55℃~+85℃
Channel Temperature	+165℃	Storage Temperature	-55℃~+150℃
Maximum VD	+13.5V		

SuperApex, LLC
2801 Lakeside Drive, Suite 208, Bannockburn, IL 60015, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

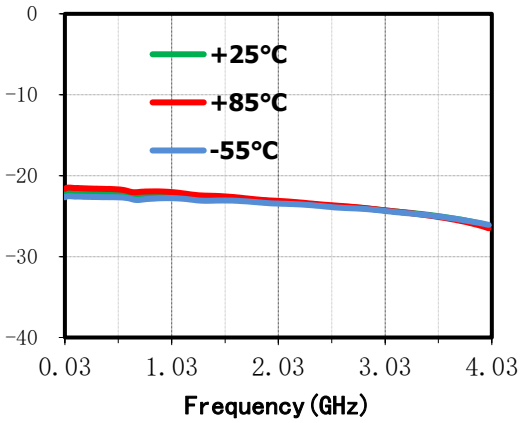
Typical Performance Curve

VD=+12V, T_A=+25℃, The following curves are taken from SAC3937AQP4 evaluation board

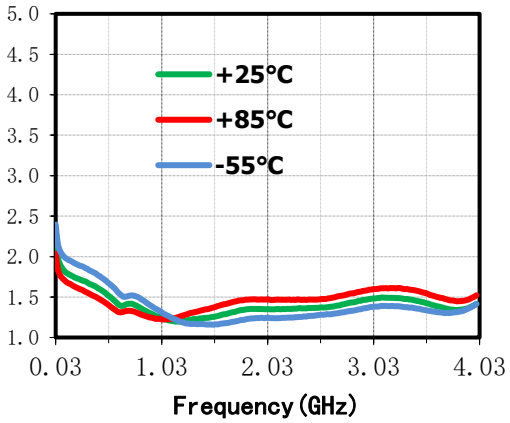
Small Signal Gain(dB) vs.Temperature



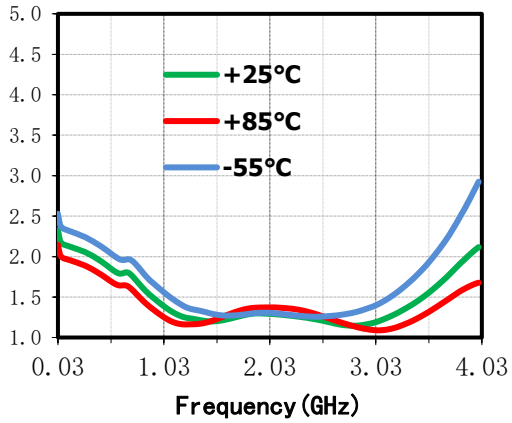
Isolation(dB) vs.Temperature



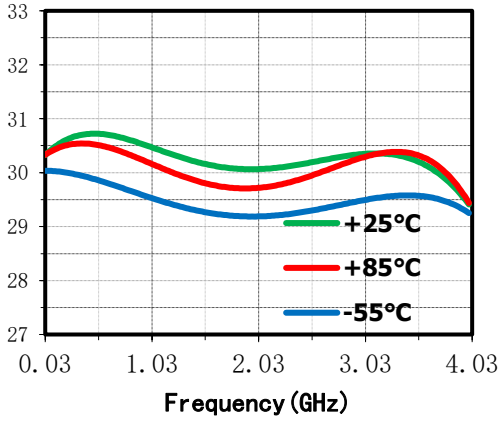
Input VSWR(:1) vs.Temperature



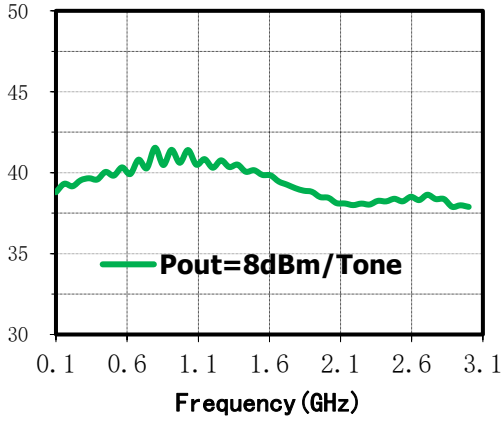
Output VSWR(:1) vs.Temperature



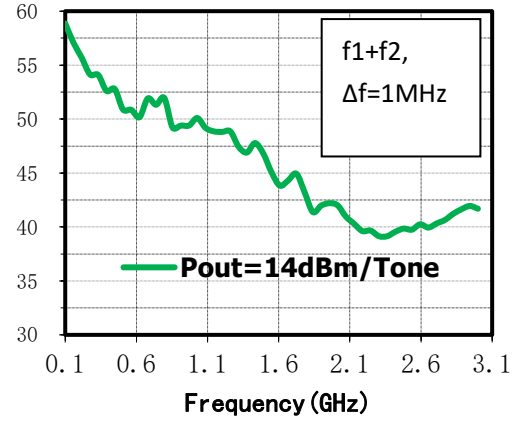
Output P_{-1}dB(dBm) vs.Temperature



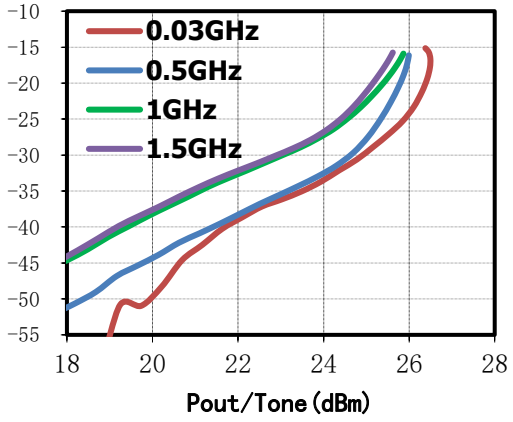
Output IP_3(dBm) vs. Frequency



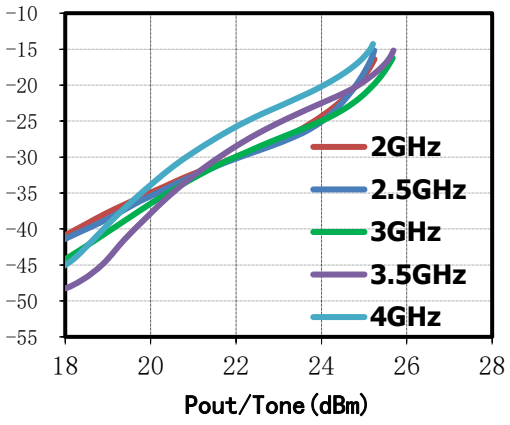
Output IP$_2$ (dBm) vs. Frequency



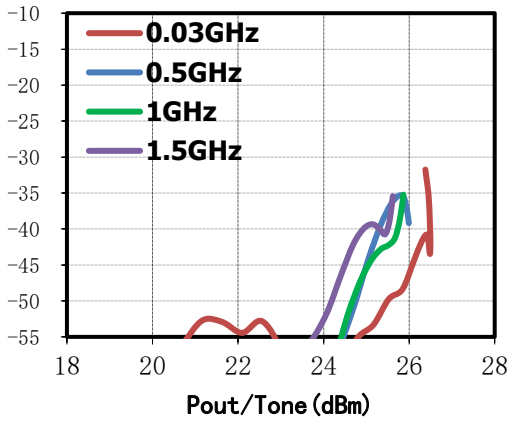
IM3 (dBc) vs. Pout/Tone



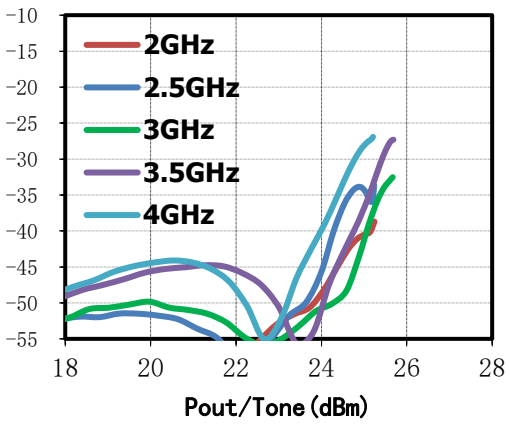
IM3 (dBc) vs. Pout/Tone



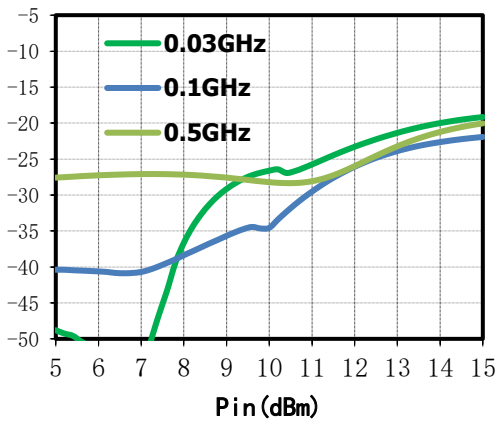
IM5 (dBc) vs. Pout/Tone



IM5 (dBc) vs. Pout/Tone

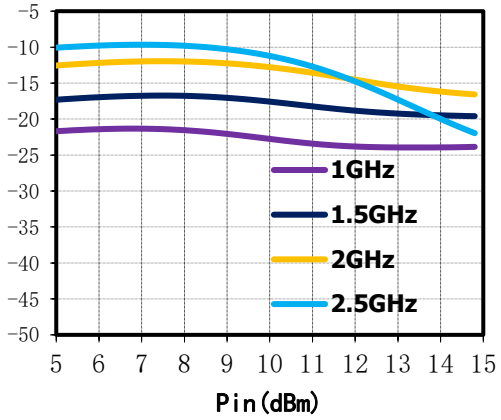


2nd Harmonic(dBc) vs.Pin

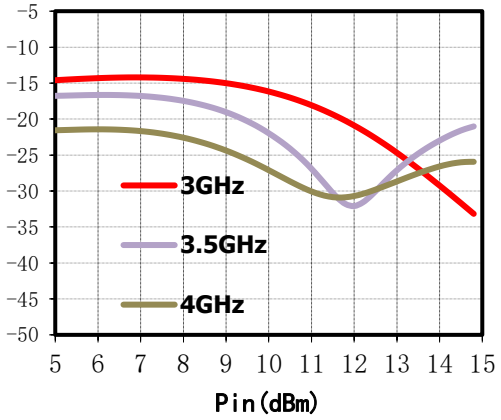


SuperApex, LLC
2801 Lakeside Drive, Suite 208, Bannockburn, IL 60015, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

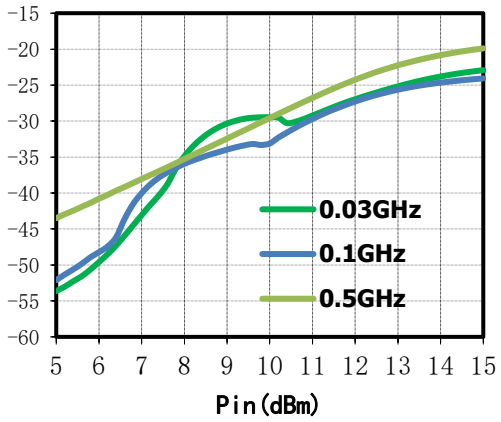
2nd Harmonic(dBc) vs.Pin



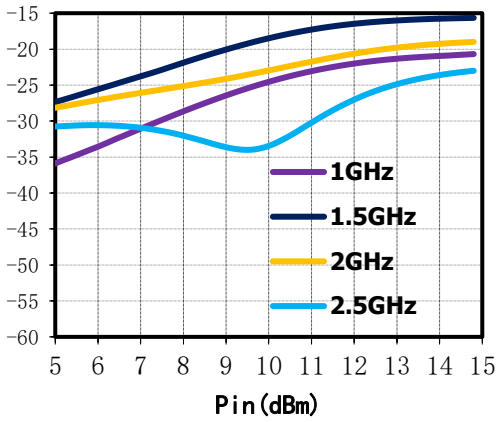
2nd Harmonic(dBc) vs.Pin



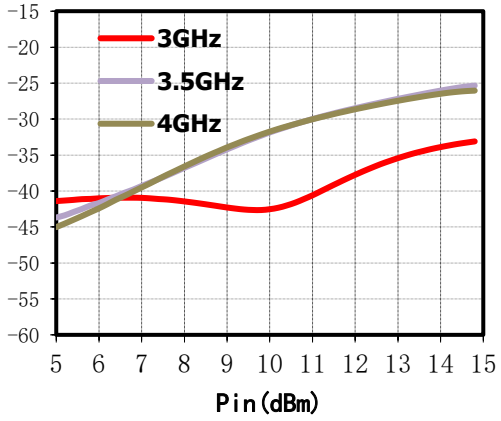
3rd Harmonic(dBc) vs.Pin



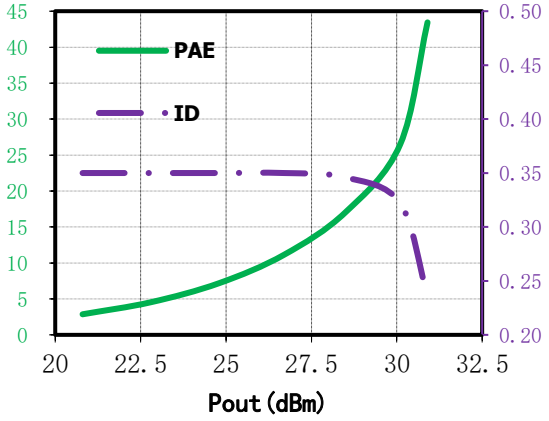
3rd Harmonic(dBc) vs.Pin



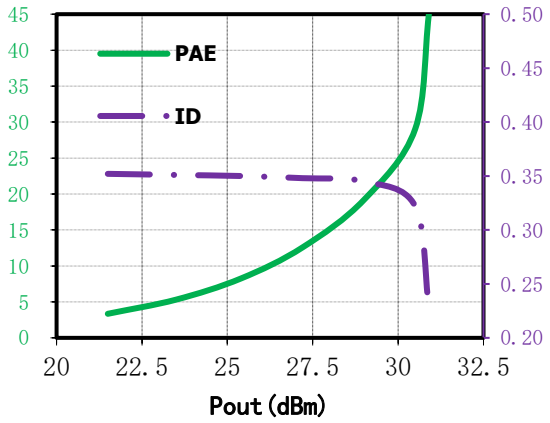
3rd Harmonic(dBc) vs.Pin



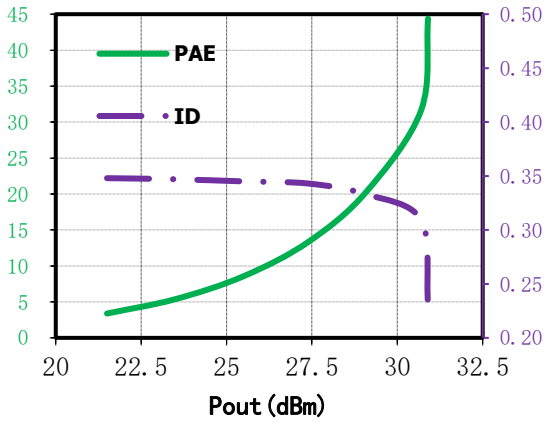
I_D(A)、PAE(%) vs. Pout,f=0.02GHz



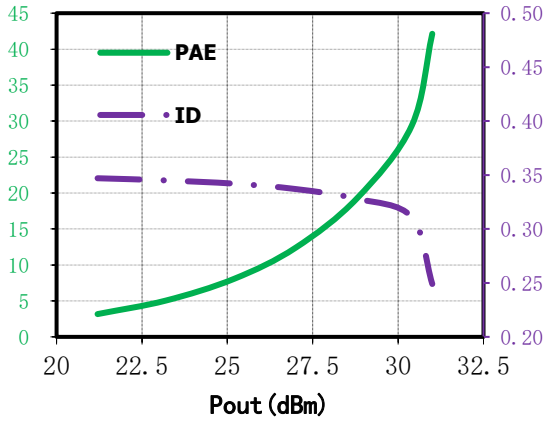
I_D(A)、PAE(%) vs. Pout,f=0.03GHz



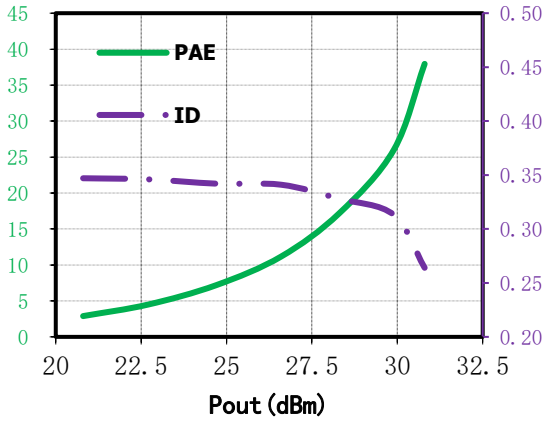
I_D(A)、PAE(%) vs. Pout,f=0.1GHz



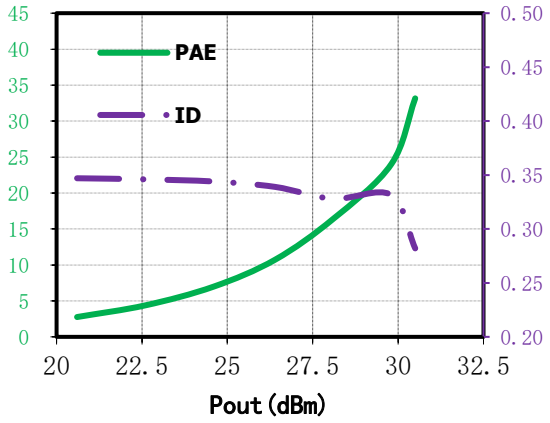
I_D(A)、PAE(%) vs. Pout,f=0.5GHz



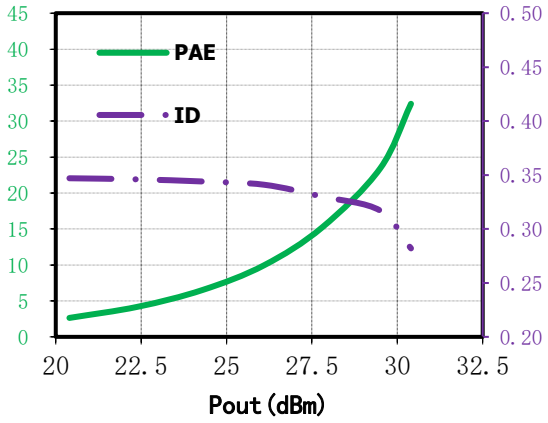
I_D(A)、PAE(%) vs. Pout,f=1GHz



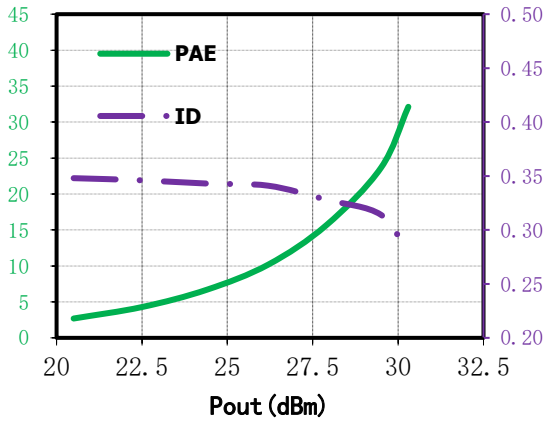
I_D(A)、PAE(%) vs. Pout,f=1.5GHz



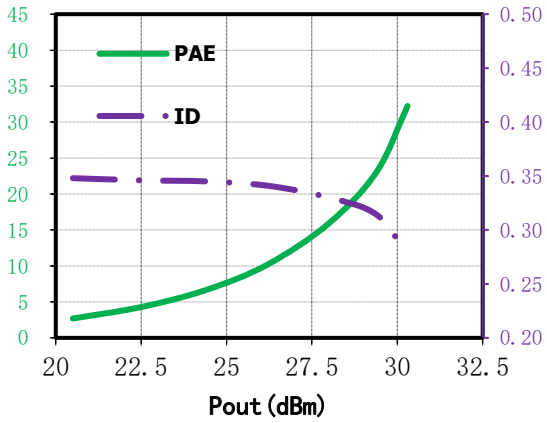
I_D(A)、PAE(%) vs. Pout,f=2GHz



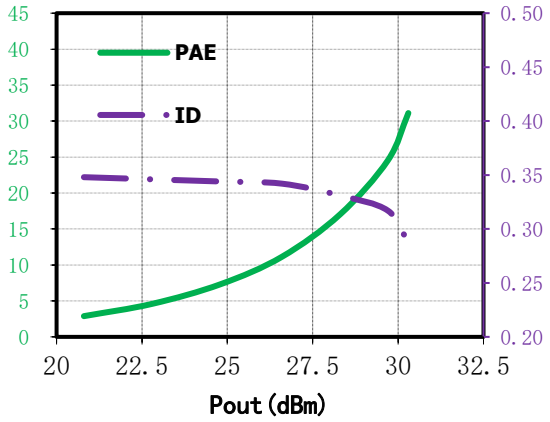
I_D(A)、PAE(%) vs. Pout,f=2.5GHz



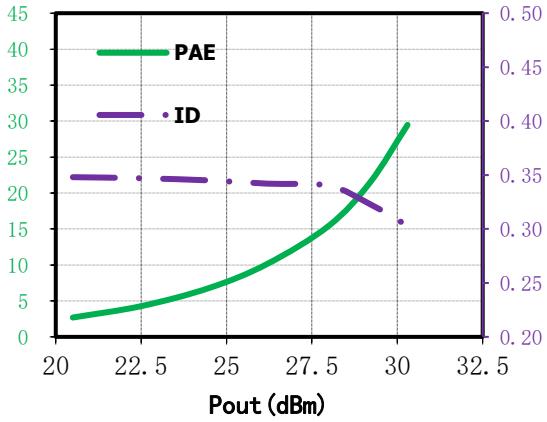
I_D(A)、PAE(%) vs. Pout,f=3GHz



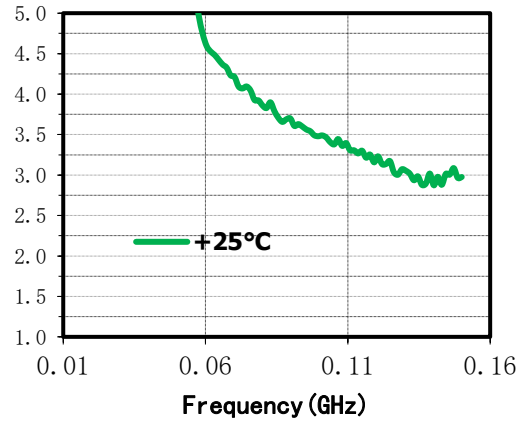
I_D(A)、PAE(%) vs. Pout,f=3.5GHz



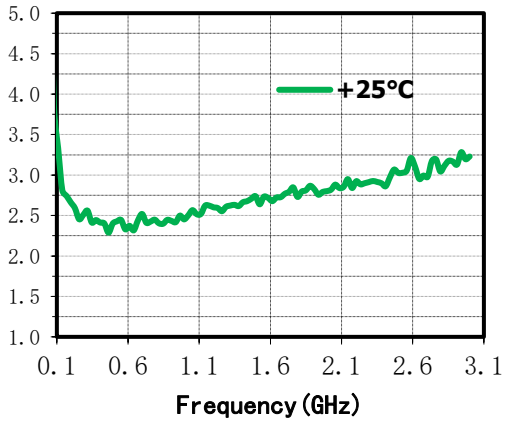
I_D(A)、PAE(%) vs. Pout,f=4GHz

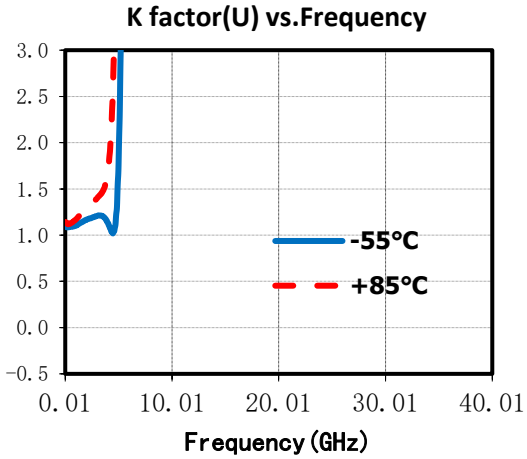


Noise Figure I (dB) vs.Frequency

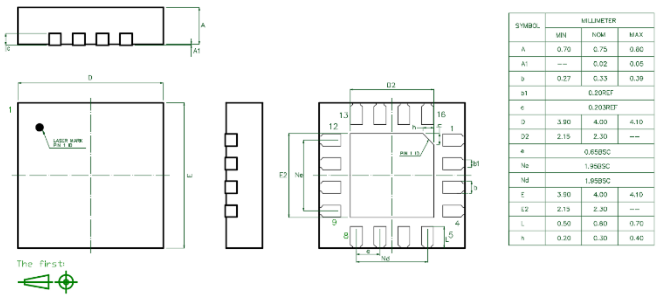


Noise Figure II (dB) vs.Frequency

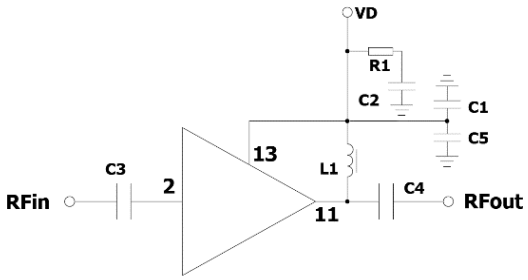




Outline Drawing



Application Circuit

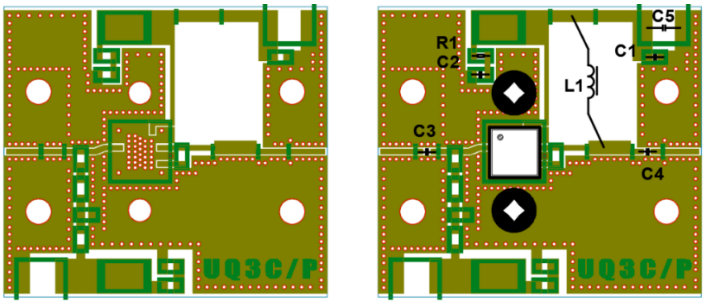


BOM

Reference Des.	Value	Part Number	Manuf.	Size
C5	22μF	—	—	1210
C3、C4、C1	430pF	—	—	0402
L1	1.3μH	4310LC-132	Coilcraft	-
R1	2.2Ω		—	0402
C2	0.1μF			0402

SuperApex, LLC
2801 Lakeside Drive, Suite 208, Bannockburn, IL 60015, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com

SAC3937AQP4 Evaluation Board

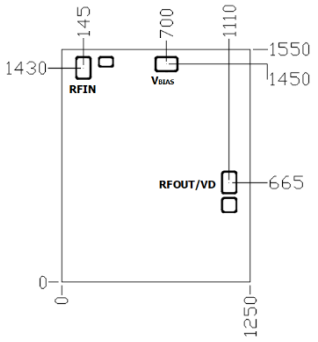


The evaluation board is a 2-layer board fabricated using Rogers 4350b t=0.254 and using best practices for high frequency RF design. The RF input and RF output traces have a 50 Ω characteristic impedance.

The bottom center pad of SAC3937AQP4 is used for RF grounding and heat dissipation. For best heat dissipation, copper-filled vias are highly recommended, SAC3937AQP4 is high power dissipation surface mount components and require a well-designed thermal mount. All the heat generated by the device is expected to be removed through the bottom heat slug with a low thermal resistance path to the chassis.

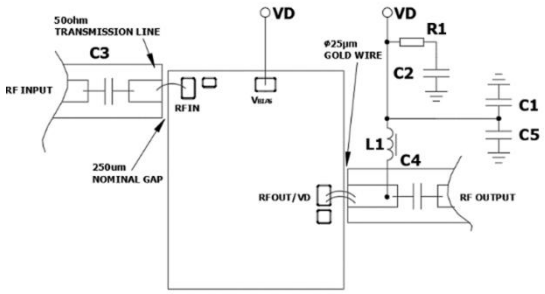
The use of multiple copper-filled vias or solder-filled vias under the package's heat slug while using a indium foil between the PCB and chassis provides a low thermal resistance mount, Insufficient number of vias or insufficient solder filling will significantly affect the heat dissipation process of the device, and then reduce the performance or even damage the device.

Bare Die Outline (μm)



Pad size 150x100μm^2, t=100μm

Assembly Diagram



Attention:

1. The moisture resistant grade of SAC3937AQP4 is 2a, the storage environment ≤30° C/60% RH，the surrounding workshop life is 4 weeks;
2. After un-packing, it is necessary to bake the parts for 6 hours in 125+/-5-degree environment before soldering;
3. GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test;
4. The back of bare chip is RF and DC ground;
5. RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 1 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized.

Revision History

Revision	Date	Comment
1.0	Nov 2, 2021	First Release

SuperApex, LLC
2801 Lakeside Drive, Suite 208, Bannockburn, IL 60015, USA
Tel: 1-847-505-8319, 1-847-573-9866
E-mail: sales@superapexco.com
Website: www.superapexco.com